

Unit 3

Use of Power Tools

INTRODUCTION

When we use hand tools, a lot of labour and time is consumed in an activity. So, a need was felt to ease the plumbing task at hand. Thus, power tools were introduced. These tools are operated by an additional power source, using electric motors, engines and compressed air, etc.

These power tools are used for various types of domestic as well as industrial work. Power tools are commonly used in the garden, in construction, in industries for drilling, shaping, cutting, sanding, grinding, routing, heating, polishing and painting, etc., Power tools may also be used for domestic tasks such as cleaning, cooking, etc., or for the loosening and tightening of fasteners, etc.

There are mainly two types of power tools used—portable and stationary. Portable power tools are movable and can be easily taken by the technician for use. For more speed and accuracy of work, stationary power tools are preferred. These cannot be moved from one place to another.

Machine tools are also known as stationary power tools. Drill presses and bench grinders used for woodwork and metal work are examples of stationary power tools.

Portable power tools produce large amounts of noise and vibration. Thus, it is necessary that the technician must use a hearing protection kit to guard oneself against the loss of hearing. The common power tools namely drills, circular saws, belt sanders, and chainsaws, operate at sound levels between the 85–100 dB. Various agencies like the NIOSH (National Institute for Occupational Safety and Health) strongly advocate the use of a hearing protection kit while using power tools at work.

Types of power tool

1. Air compressor
2. Power wrench—impact wrench, air ratchet wrench and pneumatic torque wrench
3. Multi-tool
4. Manual impact driver
5. Jigsaw power tool

Air compressor

It is a mechanical device which utilises energy to compress air. It converts power using an electric motor, mostly into potential energy stored in pressurised air (that is, compressed air). An air compressor draws more air into a storage tank, so that pressure is increased.

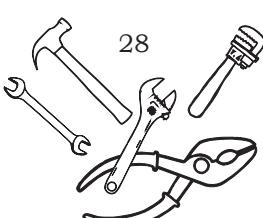
When pressure in the tank reaches its upper limits, the air compressor turns off automatically. The compressed air is stored in the tank till it is used.

Energy, in the form of compressed air is used for various purposes such as cleaning of dirt, opening the pneumatic wrench, etc. When air gets released, the tank's pressure level reaches its lower limit. Thus, the air compressor turns on again, and re-pressurising of the air in the tank starts.

An air compressor (Fig. 3.1) is different from an air pump which merely draws air from one place into another. There is no air tank in air pumps for storing the pressurised air. Air pumps are much slower, quieter,



Fig. 3.1: Air compressor



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cheaper and easy to operate than an air compressor. A heavy-duty machine uses an air compressor machine to suck dust and waste stocked in the pipeline. You must have seen big suction machines in city municipalities for various operations in sewage cleaning.

Power wrench

It is a type of wrench that uses a power source. A typical power source used is compressed air. The types of power wrenches include—impact wrenches, air ratchet wrenches and pneumatic wrenches.

Impact wrench

It is a socket wrench power tool designed to deliver high torque (a force that tends to cause rotation) output with minimal exertion by the user. It is also known as an impactor, impact gun, air wrench, air gun, rattle gun, torque gun or windy gun. Impact wrenches are mostly used in many industries, such as automotive repair, heavy equipment maintenance, product assembly, major construction projects and any other instance where a high torque output is needed (Fig. 3.2).

Impact wrenches are available in various sizes from small $\frac{1}{4}$ " drive tools for small assembly and disassembly, upto $3\frac{1}{2}$ " and larger square drives for major construction. It is used when high levels of torque is needed. For industrial plumbing work, impact wrenches are used. It helps the plumber for smooth operation of tools and machinery.

Air ratchet wrench

These are useful for loosening or tightening of low-to-medium torque bolts. An air ratchet wrench (Fig. 3.3) is very similar to a hand-operated power ratchet wrench in which an air motor is connected to turn the socket drive. When we pull the trigger, then the motor is activated which turns the socket drive. A switch is fitted to change the direction of the socket drive. This wrench is developed and used more for speed and less for torque. It is used in both domestic as well industrial plumbing work.



Fig. 3.2: Impact wrench



Fig. 3.3: Air ratchet wrench

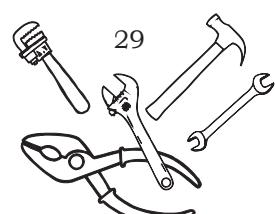




Fig. 3.4: Pneumatic torque wrench

Pneumatic torque wrench

It is a specially designed tool with a gearbox attached to a pneumatic air motor. It consists of a reaction device which absorbs the torque and lets the tool operator operate it with very little effort. The torque output is controlled by controlling the air pressure. A pneumatic torque wrench produces very little vibration with high accuracy. Such a wrench is controlled by a continuous gearing system (Fig. 3.4). This tool enables the plumber in easy opening and tightening of nuts and bolts.

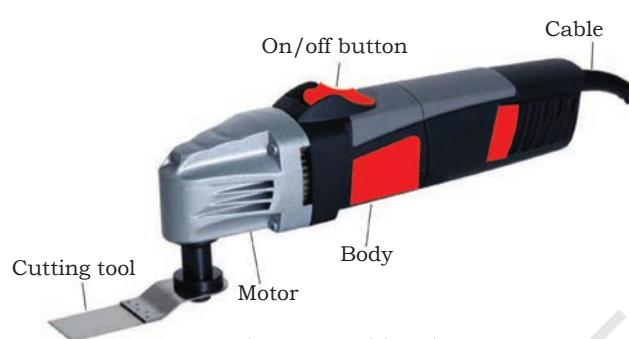


Fig. 3.5: Multi-tool

Multi-tool

It is used for multiple works like sawing, sanding, rasping, grinding, scraping, cutting and polishing, etc. Offset attachments are fitted in this unit and various types work are performed. This tool can be operated by battery or electricity. It can cut small, and precise to complex cuts (Fig. 3.5).

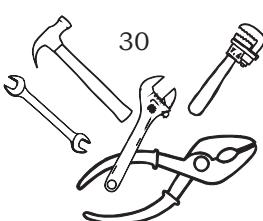
Multi-tool performs various types of plumbing work during installation and fixing the fixtures.

Impact driver

It is a high torque tool used by mechanics to loosen larger screws (bolts) and nuts which are corrosively frozen or over-torqued. These tools can produce a strong, rotational and downward force in clockwise and anticlockwise direction. This tool can also tighten the screws with greater torque than a screwdriver. This tool is smaller and light in weight than drill drivers. It may be observed that these tools are not as versatile and they perform many of the same functions. Since their torque output is higher than a typical drill driver, it makes it good for carrying out work more quickly. In plumbing works, various rusted or jammed joints, nuts and bolts, can be easily opened with this tool.



Fig. 3.6: Manual impact driver

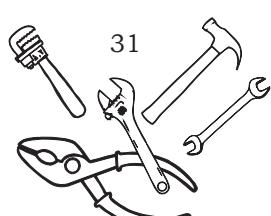


Precautions during handling of power tools

During handling and operation, the following precautions must be followed to avoid injury to the worker.

1. The work area should be free of any equipment or tool that could cause tripping hazards. Also, avoid working in slippery conditions.
2. Do not stand on uneven surface while working.
3. Do not work directly above other employees or within arm's reach of other employees.
4. Work should be done in proper light. Do not work in the dark or with poor lighting.
5. Always wear non-slippery leather shoes or boots.
6. Read and understand the operator's manual. Ensure that you are completely aware of the use and operation of the power tools. Understand the method of using the tool, its proper application and limitations.
7. Always stay alert.
8. Avoid the work of operating the tool when tired.
9. It is always recommended that new employees must be deployed to work with an experienced senior employee.
10. Protective safety goggles must be used when using power tools and saws.
11. Wear ear protection when using tools for longer duration.
12. Check the tool and ensure it is in good condition; the battery must be firmly in place.
13. Do not open battery of tools during rain.
14. Tools operated with electric wire should be regularly checked. Ensure that the electric wire is not broken or damaged. Extension cords should be grounded.
15. Do not work in watery areas.
16. Tools with bad cords or missing ground plug should be red tagged and not used.

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17. Keep the tools packed and unplugged, when not in use.
18. Avoid wearing loose clothing or keeping hair untied.
19. Be aware of electrical wire locations before drilling or sawing in the wall.
20. Do not keep the chuck key attached while drilling or saw before plugging in.

CLASSIFICATION OF IMPORTANT PLUMBING POWER TOOLS

1. Plumbing drills
2. Plumbing saws
3. Plumbing grinders

We will be discussing the different types of power tools used in plumbing and allied operations, in detail below.



Fig. 3.7: Power drill



Fig. 3.8: Drill bit (18 inches)

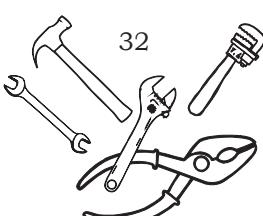
Plumbing drills

A drill is a tool fitted with a cutting tool attachment used to make holes in a surface, wall or pipes as per requirement. During drilling, the drill bits are fitted in the drilling machine.

Drill bits

These are the cutting tools that help in removing the material to create holes. Long drill bits (cutting tools to remove material to create holes) help in making a hole where pipes or wires have to be laid. Similarly, drill bits are also used for demolition projects. In a drill machine, a drill bit is used for making holes as per requirement. Common sizes of drill bits are 18 and 24 inches long. While the 18-inch drill bit is used for working off the ground or special places, the 24-inch bit is used for heavy operations.

The attachment of a drill bit is held by a chuck at one end of the drill and the same is rotated while pressing against the selected material. The tip, and sometimes edges of the cutting tool also help cut the material. This helps in cutting down thin shavings, breaking



and removing pieces of the work piece, crushing off small particles (oil drilling), counter boring, or similar operations. Drills are mostly used in metalwork, woodwork, construction and do-it-yourself projects. Specially designed drills are also used for specialised places like pharmaceuticals, space missions, etc. Heavy duty works in industrial plumbing are done with the help of a power drill.

The power drill driver is a multipurpose tool. It can be used not only to drill holes in a surface, but also as a screwdriver. With this tool, the user can drill a pilot hole and install a fastener easily. Many types of drill drivers are available in the shops; we can select a type with a keyless shank for doing frequent bit changes, smoothly and fast.

Regular power drivers are easy to use for plastic, wood, wall and softer materials. A power drill can help do the work which cannot be done with the help of a hand drill, thus, increasing productivity. For heavy work, or when working with concrete surface, a heavy duty drill machine is used. Hammer drills help break the concrete, asphalt or hard construction material.

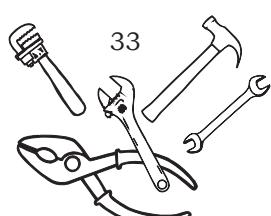
Precautions while using a power drill

The drill must be held in a safe and comfortable position with both hands to avoid the risk of hurting the wrist of the operator. Check the drill bits regularly and use the exact size of bit for drilling. Small material should be clamped properly. Large material must be held firmly. Follow the correct drill speed. Always wear safety goggles and ear protection to avoid accidents.

Plumbing saws

These are tools and machines used to cut hard material such as pipes or wood. Nowadays, plastic or polyvinyl chloride (PVC) has replaced the traditional pipes like asbestos, metal, etc. A PVC pipe is easy to cut using a handsaw or a power saw. It is because PVC only requires, that like metal, you cut the outside diameter of the pipe. While wood and metal leave behind splinters or metal filaments which can become cumbersome, PVC only leaves behind small traces of plastic particles

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which can easily be cleaned up by hand without injury. A power saw is ideal when large quantities of PVC pipe and heavy duty plastic pipes need to be cut. Power saws are however, expensive. Power saw can use the existing wood blade to cut PVC pipe without buying a special blade. With the help of power saw, cutting can be done fast, which saves a lot of time.



Fig. 3.9: Circular power saw

Circular saw

It is one of the important power saws which uses a toothed or abrasive disc or blade to cut various materials using a rotary motion. A whole saw and ring saw also apply a circular motion but it is dissimilar from a circular saw. Sometimes circular saw is also used loosely for the blade itself (Fig. 3.9).

Circular saws can be used for cutting the PVC pipes or metallic pipes in plumbing.

Hacksaw

The hacksaw is the most common tool to cut lengths of PVC pipe, as it is commonly available. Hacksaws work well, but are somewhat time consuming and can cause additional work to de-burr the edges of the cut PVC pipe. A hacksaw is the ideal tool to use if we only need to cut one or several pieces of pipe.



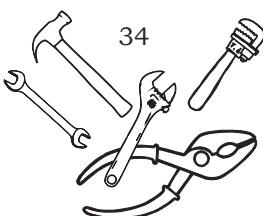
Fig. 3.10: Hacksaw

Jigsaw power tool

It is an electric saw made up of an electric motor and a reciprocating saw blade. A jigsaw can work with wood, metal, drywall or fibreglass. The blades are selected based on the work, material and project type. Blades are graded by teeth per inch (TPI). A low TPI is used for a rougher cut, and it is suitable for cutting wood. Higher TPI blades are selected for small, fine, detailed cuts (Fig. 3.11).



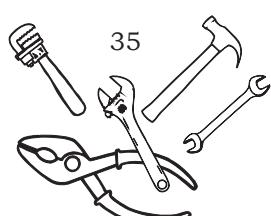
Fig. 3.11: Jigsaw power tool



Precautions during handling saw

1. Place guards on the saw correctly.
2. Keep both hands on the saw's two handles.
3. Wear safety goggles and ear protection before starting the sawing.
4. Position your body to the left or right side of the blade to avoid being kicked back.
5. Going under the material when sawing is on, must be strictly prohibited.
6. Use the recommended blade for cutting the material.
7. Check for a jammed saw; do not use such a saw.
8. Remove the plug or battery while changing blades.
9. Check the blades regularly and keep in working condition.
10. Keep perfect footing for balance.
11. Use clamps and vices for holding the material to be cut, at all times.
12. Adjust the saw for actual depth.
13. Cut slowly and carefully, the green, treated or wet material.
14. Wear a respirator (mask) to avoid dust, when cutting treated wood, concrete, tile, or stone.
15. Cut the treated lumber in an open and well-ventilated area.
16. Do not exert more load against your body while you are working.
17. Never hold wood with your hand while working.
18. Take special care if electric wire is inside the wall. Turn off electricity at the place of work or the building.
19. Take special care while cutting below the intended board.
20. Always follow safety instructions given in the operator's handbook.

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Plumbing grinder

A grinder consists of an abrasive wheel which works as the cutting tool. The grinder abrasive stone on the wheel's surface cuts a small chip from the work piece via deformation. Grinding is applied for finishing work pieces for high surface quality and better accuracy of shape and dimension. A grinder helps in grinding upto the order of 0.000025 mm. Grinder can do a concluding operation and deletes comparatively small metal, about 0.25 to 0.50 mm depth. In plumbing works, various types of finishing work are done with help of grinder.



Fig. 3.12: Grinder

Practical Exercises

Activity 1

Visit a hardware store and make a list of the plumbing power tools available.

Material required

1. Pen
2. Paper and
3. File

Procedure

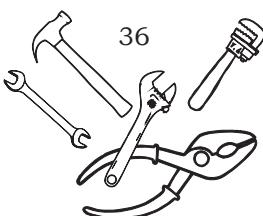
1. Identify the hardware store in your area and visit it.
2. Based on your reading of this Unit, collect the information of the different plumbing power tools available.
3. Collect a pamphlet or leaflet of the tools, if available. Else click pictures of the tools you can find.
4. Attach these in your file after identifying each of these.

Activity 2

Visit to a construction site of a commercial building or manufacturing industry

Material required

1. Pen
2. Paper and
3. File



Procedure

1. Visit a construction site of a commercial building or manufacturing industry with your teacher.
2. Observe and identify the power tools being used at the site.
3. Discuss with the technician regarding the handling of power tools.
4. Discuss the safety features of the power tools.
5. Based on this visit and your conversation with the technician, make a report of the same.

Activity 3

Assembling and disassembling the parts of a compressor

Material required

1. Compressor
2. Tool kit
3. Cotton duster
4. Mat or bedsheets

Procedure

1. Take the compressor available in school.
2. Switch off the plug and remove the cable.
3. Read the operator's manual for instructions on disassembling.
4. With the help of tools, disassemble the components.
5. Identify each of the parts.
6. With the help of tools, assemble the components.
7. Operate the compressor and check any noise, etc.
8. Clean the tools and keep in a tool box.

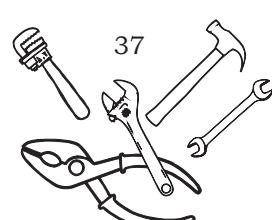
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Check Your Progress

A. Answer the following questions

1. Why do we use power tools?
2. Discuss three important power tools used in plumbing.
3. Differentiate between hand tools and power tool.
4. Why do we use a multi-tool?
5. Why is it necessary to take precautions during the handling of power tools?

USE OF POWER TOOLS



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B. Fill in the blanks

1. Power tools are classified as either _____ or portable.
2. Hand held power tools produce a large amount of _____.
3. Power plumbing drill is also used for _____.
4. _____ should be placed on the saw while operating.
5. Air compressor converts power into _____ energy.

C. Multiple choice questions

1. An impact wrench is also known as
 - (a) impact gun
 - (b) air wrench
 - (c) air gun
 - (d) All of these
2. Power tools are mostly used for
 - (a) heavy work
 - (b) light work
 - (c) simple work
 - (d) None of these
3. A jigsaw with a bevel function on the sole plate allows cutting angles of upto
 - (a) 45 degrees
 - (b) 60 degrees
 - (c) 30 degrees
 - (d) 35 degrees
4. An air compressor is a device that converts power into
 - (a) kinetic energy
 - (b) rotational energy
 - (c) potential energy
 - (d) None of these
5. Drills are commonly used in
 - (a) woodwork
 - (b) metal work
 - (c) construction
 - (d) All of these

